REMARKS

Applicants appreciate the Examiner's further explanation of the bases for rejection of Claim 1 that has been provided in the section "Response to Arguments" beginning on page 2 of the Office Action dated August 3, 2010. Applicants submit that the pending claims are patentable over the cited references and provide the following response to the Examiner's Response to Arguments without repeating all of the other reasons for patentability explained in their Amendment of July 26, 2010, which is incorporated herein and not repeated for sake of brevity.

Claim 1 recites (bracketed numbering added):

1. A method for supporting frame synchronization in a digital communication system, the method comprising the steps of:

(1) mapping a codeword specifying framing information of a frame according to a signal constellation to output a data stream;

(2) duplicating and demultiplexing the data stream into a first data stream and a second data stream that are the same as each other;

(3) modifying the first data stream according to a predetermined operation;

(4) multiplexing the modified first data stream with the second data stream to form a frame synchronization structure in the multiplexed data streams; and

(5) outputting a physical layer signaling header corresponding to the frame based on the multiplexed data streams.

The Office Action continues to combine the teachings of four different patent references to conclude that Christodoulides discloses the first and last steps (1) and (5), that Miyoshi discloses only the duplicating portion of step (2) and Mowbray discloses only the duplicating portion of step (2), that Raleigh discloses step (3), and that Raleigh discloses a portion of step (4) and Miyoshi discloses another portion of step (4). The Supreme Court in *KSR* concluded that "a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *KSR*, 127 S.Ct. at 1741. As such, the Court noted that it was "important to identify a reason that would have prompted a person of

ordinary skill in the relevant field to combine the [prior art] elements" in the manner claimed, and, for that reason, the analysis regarding whether such reason existed "should be made explicit." KSR, 127 S.Ct. at 1731.

The Office Action has provided no reasoning for why a person of ordinary skill in the relevant field would have been prompted to combine elements from Christodoulides, Mowbray, Miyoshi, and Raleigh to arrive at the invention of Claim 1 without improper hindsight to the present application disclosure. In particular, steps (2), (3), and (4) of Claim 1 form a frame synchronization structure in the multiplexed data streams. In an attempt to provide sufficient basis for rejecting steps (2), (3), and (4), the Office Action has had to separately pick apart each of the steps in order to apply different references and combinations of references to each enumerated step of Claim 1. However, it appears that when stringing together the disparate teachings of these references, the Examiner's argument has lost sight of that steps (2), (3), and (4) are not merely duplicating and demultiplexing, modifying, and multiplexing, but instead performed the recited functions that form a frame synchronization structure from multiplexed data streams. Applicants request that if the Examiner maintains the rejections based on these four references that a detailed explanation be provided for why a person of ordinary skill in the relevant field would have been prompted to combine elements from Christodoulides, Mowbray, Miyoshi, and Raleigh to arrive at the entire invention of Claim 1.

Regarding Christodoulides, the Office Action attempts to rebut Applicants explanation of why Christodoulides does not disclose steps (1) and (5) of Claim 1, as follows:

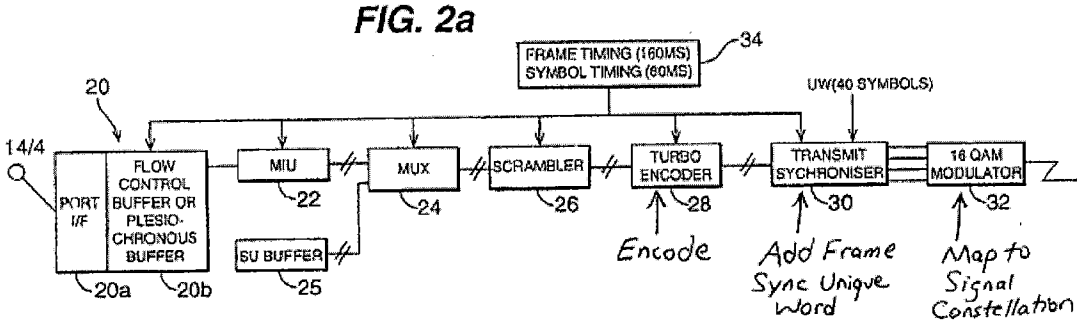
> First of all, the Examiner respectfully submits that Applicants aren't replying on what is being claimed. <u>The claim only says that the codeword is mapped according to a signal constellation. Therefore, it doesn't really matter when the mapping is occurr[ing] as long as the claim explicitly doesn't say it.</u> (Office Action, page 2, emphasis added)

Applicants respectfully disagree because step (1) recites that a codeword specifying framing information of a frame is mapped according to a signal constellation to output a data stream, and step (5) recites that a physical layer signaling header corresponding to the frame is output based on the multiplexed data streams. Claim 1 defines that the "multiplexed data streams" form a frame synchronization structure that is generated by the operations of steps (2), (3), and (4), each of which occurs after the mapping of step (1).

In sharp contrast to Claim 1, Christodoulides discloses in Fig. 2a (below) an opposite order in which a unique word (UW) frame synchronization symbols are added (i.e., output of Transmit Synchroniser 30) to turbo encoded data (i.e., output of Turbo Encoder 28), and **then** the turbo coded data and added UW frame synchronization symbols are mapped to a signal constellation (i.e., 16 QAM Modulator 32).

Christodoulides Fig. 2a (Annotated)

FIG. 2a



More particularly, Christodoulides describes that the "unique word [UW] symbols comprise only two bits, mapped onto the most protected bits u_1, U_3 of the 16 QAM constellation." (Christodoulides, col. 5, lines 46-48). Thus, the two bit UW symbols have been added to the turbo coded data before the combination is mapped to the 16QAM constellation. Christodoulides is devoid of any description or suggestion that the UW frame synchronization symbols are added **after** the code word is mapped to the signal constellation.

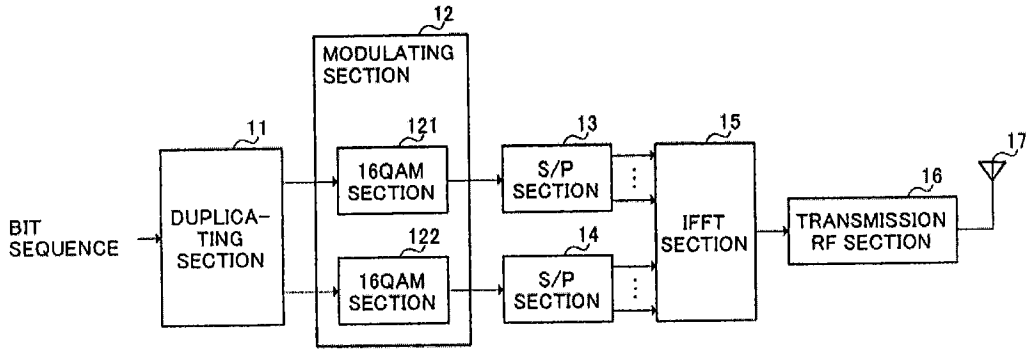
Moreover, Christodoulides does not describe or suggest that the UW symbols are somehow formed from multiplexed data streams that flow a codeword specifying framing information. In sharp contrast, Christodoulides teaches that the UW symbols are "a **predetermined sequence** of 40 symbols" that is known to and used by a receiving device "to assist in acquiring the signal and determining the signal type." (Christodoulides, col. 5, lines 48, emphasis added) Being a predetermined sequence, Christodoulides' UW symbols cannot be formed from the random user data that becomes the turbo encoded data, otherwise the resulting randomized UW symbols would be unknown to the receiving device and could not be recognized by the receiving device as a frame synchronization structure.

Christodoulides therefore does not disclose any of steps (1)-(5) of Claim 1. Moreover, Christodoulides teaches away from Claim 1 by: 1) teaching that the signal constellation mapping is performed **after** the UW frame synchronization structure is added to the encoded block; and 2)

teaching that the frame synchronization structure is a predetermined sequence of 40 symbols. It is therefore improper to combine Christodoulides with the other cited references to reject Claim 1 in view of, for example, MPEP §2145(D)(2) which states that "it is improper to combine references where the references teach away from their combination."

The Office Action appears to have changed its argument against the patentability of step (2) of Claim 1, conceding that Mowbray and Miyoshi each disclose only a portion of step (2). In particular, the Office Action contends on page 6 that "Mowbray teaches demultiplexing the data stream into a first and a second data stream" and that "Miyoshi teaches the demultiplexed packets are duplicating packets that are the same as each other." However, Mowbray's "de-multiplexer 14 ... distributes **successive portions** (e.g. 8-symbol bytes) of a packet for transmission along each of two paths 16 and 18 **alternately**." (Mowbray, col. 3, lines 10, emphasis added) Thus, the de-multiplexer 14 breaks the input data packet into successive portions that are alternately distributed through two different data paths. For example, one path carries odd numbered portions and the other path carries even numbered portions in an alternating back and forth distribution of successive portions of the input data packet.

Miyoshi Fig. 1



However, if Mowbray's multiplexer 14 is used upstream of Miyoshi's duplicating section 11, then only one-half of the data stream that is input to Mowbray's multiplexer 14 would be output to Miyoshi's duplicating section 11, while the other half of the data stream (i.e., the alternate successive portions) input to Mowbray's multiplexer 14 would be lost. The combination of Mowbray and Miyoshi therefore does not disclose the recitations of step (2) of "duplicating and demultiplexing the data stream into a first data stream and a second data stream that are the same as each other."

Moreover, Miyoshi operates oppositely to the claimed sequence of steps (1) and (2) because the bit sequence is duplicated (duplicating section 110) and **then** the duplicated bit sequences are mapped to separate signal constellations (modulating section 12). The Office Action states that "the Examiner doesn't see any difference between duplicating the data stream first or after mapping, as the output result is the same." However, the Examiner's conclusion is contrary to Miyoshi's description that because the duplicated data streams from duplicating section 11 are fed to parallel 16QAM section 121 and 16QAM section 122, the "**result [is that] multiple same bits are included in each different symbol**" output therefrom. In contrast, if one 16QAM section were used and its order with the duplicating section 11 were reversed, which Miyoshi is devoid of any support for doing, the "**result" would not be "multiple same bits ... included in each different symbol"** and instead would be the same sequence of symbols in two different streams.

The combination of Miyoshi and Mowbray therefore does not disclose step (2) of Claim 1. Moreover, Miyoshi and Mowbray teach away from the claimed sequence of step (1) which outputs a data stream that is formed by mapping a codeword to a signal constellation, followed by step (2) which duplicates and demultiplexes the signal constellation mapped codeword into first and second data streams that are the same as each other. It is therefore improper to combine Miyoshi with Mowbray to reject Claim 1.

> Regarding step (4) of Claim 1, the Office Action provides the following rebuttal:
>
> First of all, Raleigh clearly teaches that the source data is partitioned into two data streams (I data and Q data). **Second, Raleigh doesn't say that the two are different.** Third, Miyoshi pretty teaches duplicating the data stream. Therefore, what is needed is modifying one of the data streams of Miyoshi by multiplying a constant number, in the data stream doesn't have to be the same because this is already taught by Miyoshi. (Office Action, page 4, emphasis added)

However, the Examiner's conclusion that "Raleigh doesn't say that the two [Inphase "I" data and Quadrature "Q" data] are different" is clearly contrary to Raleigh's teaching. Raleigh describes that "in the embodiment shown in FIG. 2, ... the coded bits from each encoder 210 are provided to a pulse amplitude modulation (PAM) constellation map element 220 that partitions the coded bits into sets of bits and maps each set into a PAM symbol. The PAM symbols from

map element 220b are provided to a multiplier 222 that multiplies the PAM symbols with a complex value "i" to provide quadrature PAM symbols." Consequently, only the Quadrature "Q" data is multiplied by the complex value "i" which phase shifts the Quadrature "Q" data by $\pi/2$ (quadrature shift) relative to the Inphase "I" data.

Raleigh Fig. 2

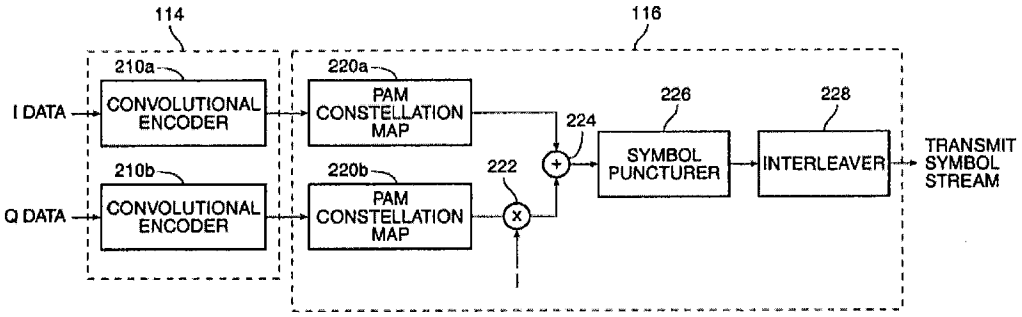


FIG. 2

Moreover, Raleigh teaches that the Inphase "I" data and the Quadrature "Q" data are added by node 224. Nowhere does Raleigh teach or suggest that the Inphase "I" data and the Quadrature "Q" data are multiplexed to form a stream and, much less, to form a "frame synchronization structure in the multiplexed data streams" as recited in steps (4) and (5) of Claim 1.

Furthermore, the Inphase "I" data and the Quadrature "Q" data are not generated by mapping a word, much less a codeword specifying framing information of a frame, to a signal constellation. In sharp contrast thereto, Raleigh teaches that the Inphase "I" data is mapped to a pulse amplitude modulation (PAM) constellation map by element 220a and that the Quadrature "Q" data is mapped to a PAM constellation map by element 220b. Raleigh therefore teaches an opposite order of operations to that recited by Claim 1 in which step (4) follows step (1). It is therefore improper to combine Raleigh with the other cited references to reject Claim 1.

Claim 1 is therefore submitted to be patentable over Christodoulides in view of Mowbray, Miyoshi, and Raleigh because the combination does not disclose all claimed steps and, moreover, at least Christodoulides, Miyoshi, and Raleigh are not combinable because they teach away from Claim 1.

Independent Claims 5, 6, 16, and 17 recite, *inter alia*, similar mapping, duplicating, multiplexing, and outputting steps/features as recited in Claim 1. The Office Action on pages 7-8 has referred to its findings made for Claim 1 as to where these features are allegedly

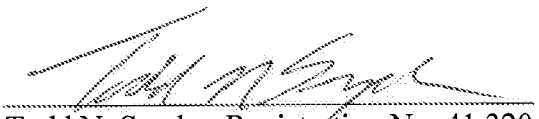
disclosed by the cited references. Applicant therefore submits that independent Claims 5, 6, 16, and 17 are patentable for at least the reasons explained above for Claim 1.

CONCLUSION

Therefore, the present application overcomes the rejections of record and is in condition for allowance. Favorable consideration is respectfully requested. If any unresolved issues remain, it is respectfully requested that the Examiner telephone the undersigned attorney so that such issues may be resolved as expeditiously as possible.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-0383 and please credit any excess fees to such deposit account.

Respectfully Submitted,



Date: November 3, 2010

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